

<p>(51) International Patent Classification 6 : B29C 65/10, B65B 51/20</p>	<p>A1</p>	<p>(11) International Publication Number: WO 98/40202 (43) International Publication Date: 17 September 1998 (17.09.98)</p>
<p>(21) International Application Number: PCT/GB98/00666 (22) International Filing Date: 6 March 1998 (06.03.98) (30) Priority Data: 9704812.8 7 March 1997 (07.03.97) GB (71) Applicant (for all designated States except US): MOLINS PLC [GB/GB]; 11 Tanners Drive, Blakelands, Milton Keynes MK14 5LU (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): FINCHAM, Kevin, Richard [GB/GB]; 13 Westwood Way, Westwood Business Park, Coventry CV4 8HS (GB). THUMS, Jamie [GB/GB]; 101 Lilac Road, Beeston, Nottingham NG9 1PF (GB). (74) Agent: HIRSH, Ivan, Yehudi; Molins plc, Group Patent Dept., Haw Lane, Suanderton, High Wycombe, Buckinghamshire HP14 4JE (GB).</p>		<p>(81) Designated States: US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: PACKAGING MACHINE</p>		
<p>(57) Abstract</p> <p>A VFFS (vertical form, fill and seal) packaging machine, in which a web of bag-forming material (23) is driven downwards at a cyclically varying speed around a former (24) to overlap the edges of the web, and including a hot air device (10) for directing hot air onto the overlapping edges so as to seal them, characterised in that the hot air device (10) is supplied with air by a variable-speed blower (13) which automatically varies the velocity of the hot air directed towards the edges of the web, depending upon the speed of the web.</p>		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

Packaging Machine

This invention is concerned with packaging machines of the type commonly referred to as a VFFS (vertical form, fill and seal) packaging machine. An example of such a machine is described in British patent specification No. 2056940. That specification describes a machine of the type in which horizontal seals are formed intermittently and in which the tube of bag forming material is accordingly fed intermittently. The present invention is concerned particularly (though not exclusively) with a machine of the type described in which the bag-forming material is fed continuously or substantially continuously, and in which each horizontal seal is formed by a pair of cooperating sealing jaws which move with the bag material while forming the seal and usually also while forming a horizontal cut to separate successive bags.

In a continuous motion machine, the horizontal seals may be formed by cooperating rotary sealing jaws (or rotary double jaws forming two seals during each revolution) or by cooperating sealing jaws which move in a constant orientation along a D-shaped path so as to remain in contact with the bag material while moving through a predetermined straight-line path during which each seal is formed. The present invention is more particularly concerned with machines including such D-motion sealing jaws.

The longitudinal seam by which the edges of a web forming the tube are joined may be achieved in various ways. In the past use has been made of heated bands and there has also been a proposal according to which hot air could be used to form the heat seal with suitable packaging material of which an example is polythene. A prior proposal involving the use of hot air is described in US patent specification No. 5,466,326.

According to the present invention, in a machine of the type described, the web of bag-forming material is driven downwards at a cyclically varying speed around a former to overlap the edges of the web (in simple overlap fashion or to form a butt joint), and the means for sealing the overlapped edges longitudinally comprises a hot air device for directing hot air onto the overlapping edges so as to seal them, characterised in that the hot air device is supplied with air by a variable-speed blower which automatically varies the velocity of the hot air directed towards the edges of the web, depending upon the speed of

1 the web.

2 Downstream of the hot air device there is preferably means for
3 blowing cool air onto the seam to set the seal.

4 The web speed is varied cyclically in a controlled manner in order
5 to allow control of the bag length. For the same purpose, the speed of
6 the sealing jaws is preferably also varied cyclically. During each cycle,
7 between successive sealing operations, the web speed may be
8 increased to increase the bag length and/or the speed of the sealing
9 jaws may be decreased to increase the bag length. In practice a range
10 of bag lengths may be achieved by suitable control of the speed patterns
11 of both the web and the sealing jaws, the only essential criterion in a
12 continuous-motion machine being that the speeds should be equal while
13 the sealing jaws are in contact with the bag material.

14 The speed of the hot air blower may be stepped between two
15 levels, one corresponding to the speed of the web during sealing, and
16 the other to the speed or average speed of the web between successive
17 sealing operations. Preferably, however, the blower is driven by a
18 variable speed motor which is continuously controlled by an inverter
19 control circuit in response to the speed of the web.

20 This invention enables a substantially uniform longitudinal seam to
21 be formed, notwithstanding variations in the speed of the bag-forming
22 material.

23 The air heating section of the hot air gun is preferably maintained
24 at a substantially constant but adjustable temperature. In contrast, the
25 disclosure of US patent 5,466,326 is based on control of the heating
26 element temperature and is not believed to be practically capable of
27 achieving as uniform a seam as can be achieved by the present
28 invention. The reason for this is that the temperature of a heating
29 element cannot be rapidly altered to allow the hot air temperature to
30 track the speed of the web. Alternatives described in US patent
31 5,466,326 are also not believed to be as satisfactory as the present
32 invention in terms of allowing rapid control of the air sealing operation in
33 response to web speed. Furthermore, the application of cool air,
34 preferably in the form of a thin film of air, is believed to be important,
35 though other means of cooling the seam may alternatively be
36 substituted.

37 An example of a longitudinal seam forming arrangement
38 according to this invention is shown in the accompanying drawings. In

1 these drawings:

2 Figure 1 is a side view of the hot and cold air blowing
3 arrangements;

4 Figure 2 is a view from the right of Figure 1, showing the nozzles
5 through which hot and cold air are blown; and

6 Figure 3 is a plan view of part of the apparatus.

7 Figure 1 shows a hot air gun 10 into which air is blown through a
8 duct 12 by a suitable blower represented diagrammatically as item 13.
9 Power is supplied to the gun 10 by a cable 14, and the gun includes a
10 temperature adjuster 16.

11 Hot air from the gun 10 enters a hollow body 18 having a side
12 outlet formed by converging walls 18A and 18B (see particularly Figure
13 3) leading to a narrow nozzle portion formed by closely spaced parallel
14 walls 20 and 22 (see Figure 2). The walls 20 and 22 may be spaced
15 apart, for example, by 2mm or less. A hot air jet is thus directed from the
16 nozzle towards the overlapping edges of a web of packaging material 23
17 formed into a tube around a cylindrical former 24 (Figure 3), the
18 overlapping edges being in the region 23A.

19 Immediately after passing the hot air nozzle, the seam is secured
20 by a film of cool air directed towards it by a nozzle 26 supplied with cool
21 air via a tube 28. As shown in Figure 2, the nozzle 26 may comprise
22 three closely spaced parallel walls 26A so as to direct towards the seam
23 two thin films of cool air. Alternatively, however, the nozzle 26 may direct
24 a single film of air towards the seam and may be inclined to the centre
25 line of the seam so as to cover the entire width of the seam.

26 By way of example, the hot air nozzle 10 may be one
27 manufactured by Leister Elektro-Gerätebau, of 6056 Kägiswil,
28 Switzerland, for example their device identified as the Leister Hot Air Tool
29 3000. The variable-speed blower, including a variable speed motor, may
30 also be of a type offered by the same company.

31 The cold air nozzle or "air knife" may be of a type manufactured by
32 Lechler. It may receive its air supply from the blower which supplies air
33 to the hot air nozzle, so that the air velocity will also vary according to the
34 bag material speed.

35 As shown in Figure 2, two non-metallic cheeks 32,34 are secured
36 to the outside surfaces of both of the walls 20,22 forming the hot air
37 nozzle. These cheeks prevent the packaging material from contacting
38 the nozzle, for which purpose the outer edges of the nozzle walls are

1 recessed within the outer surfaces of the cheeks 32,34, which may be
2 chamfered as shown in Figure 3.

3 Figure 3 shows the hot air nozzle in a retracted position allowing a
4 pivoted cover plate 36 to be moved into line with the nozzle. This
5 prevents hot air from the nozzle reaching the packaging material while
6 the machine is temporarily stationary. The hot air gun is maintained at a
7 constant working temperature even while the machine is temporarily
8 stationary, and the blower may be kept running at a slow speed. The
9 cover plate 36 is moved automatically, by a cam action, to the position in
10 line with the hot air nozzle when the nozzle is retracted.

11 The bag-forming material may be drawn along the former 24, for
12 example, by means of bands on opposite sides of the mandrel which
13 may drive the material with the aid of suction applied through apertures
14 in the bands. Alternatively, bands (possibly without suction) may be
15 used to pull the material forward and maintain it in tension while the
16 actual speed of the material is controlled by other means, for example
17 rollers upstream of the former 24.

18 As shown in Figure 3, the longitudinal seam forming apparatus is
19 mounted on a horizontal rod 38. It can be set at various positions along
20 the rod, by means of a clamp 40, to accommodate formers of different
21 sizes.

22 This invention may also be applied to an intermittent machine, that
23 is to say one in which the web stops to allow intermittently moving
24 sealing jaws to operate to form successive horizontal seals serving as
25 the top of each bag and the bottom of the next bag. The blower is
26 preferably arranged to run at a fixed low speed while the web is
27 stationary, and at a higher variable speed while the web is moving; as
28 before, the web speed preferably varies cyclically in a predeterminable
29 pattern to achieve the desired (adjustable) bag length.
30
31
32
33
34
35
36
37
38

CLAIMS

1. A packaging machine of the type described, in which a web of bag-forming material (23) is driven downwards at a cyclically varying speed around a former (24) to overlap the edges of the web, and including a hot air device (10) for directing hot air onto the overlapping edges so as to seal them, characterised in that the hot air device (10) is supplied with air by a variable-speed blower (13) which automatically varies the velocity of the hot air directed towards the edges of the web, depending upon the speed of the web.

2. A machine according to claim 1, including means (26) for blowing cool air onto the seam downstream of the hot air device (10) to set the seam.

3. A machine according to claim 1 or claim 2, in which the web of packaging material (28) is driven continuously at a cyclically varying speed.

4. A machine according to claim 3, in which the blower speed is continuously variable so as to increase when the web speed increases and vice versa.

5. A machine according to claim 3, in which the blower is set to operate at two or more set speeds.

6. A machine according to claim 1 or claim 2, in which the web is arranged to be stopped at regular intervals while horizontal seals are made which form the top of each bag and the bottom of the next bag.

7. A machine according to claim 6, in which the hot air device includes a nozzle which is arranged to move away from the web while the web is stationary.

8. A machine according to claim 7, in which the blower is set to run at a fixed low speed while the web is stationary and at a higher variable speed while the web is moving.

1
2 9. A machine according to any one of claims 1 to 8, in which
3 the hot air device (10) including an air heating device which is
4 maintained at a constant but adjustable temperature.

5
6 10. A method of packaging products involving a machine of the
7 type described, in which a web of bag-forming material is driven
8 downwards at a cyclically varying speed around a former to overlap the
9 edges of the web, and a hot air device is arranged to direct a stream of
10 hot air onto the overlapping edges so as to seal them, characterised in
11 that the hot air device is supplied with air by a variable-speed blower
12 which automatically varies the velocity of the air directed towards the
13 edges of the web, depending upon the speed of the web.
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38

Fig.1.

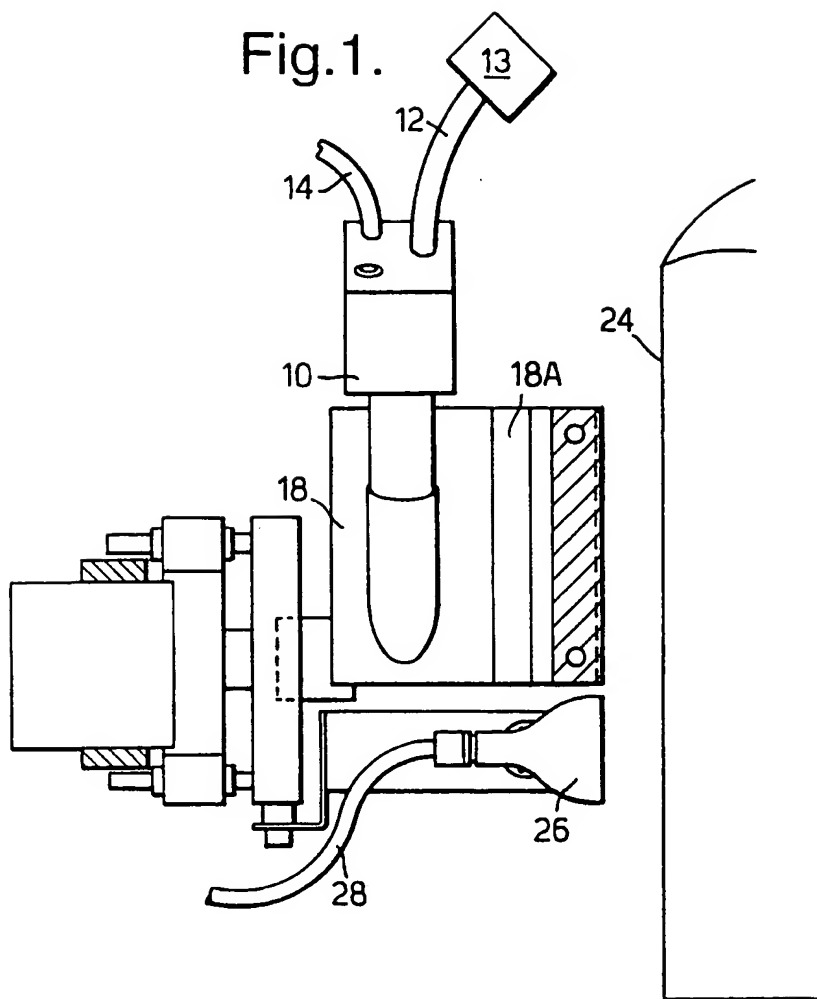


Fig.2.

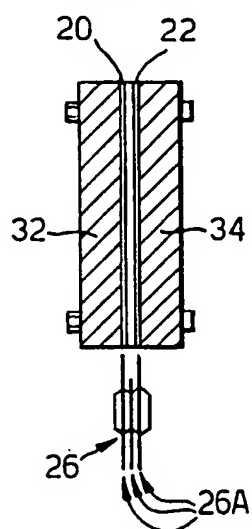
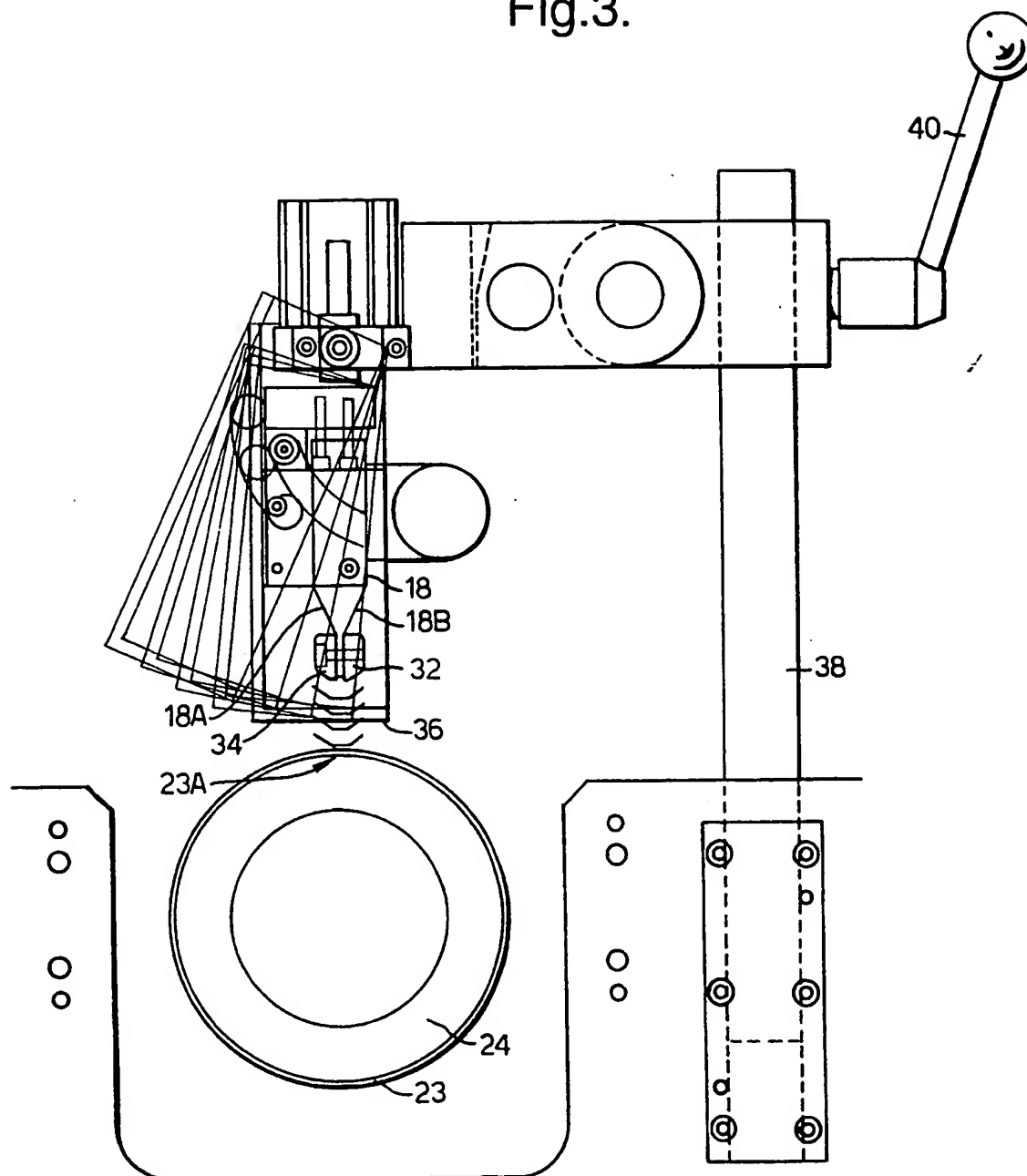


Fig.3.



INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 98/00666

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B29C65/10 B65B51/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B29C B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 218 863 A (HOWARD THOMAS B ET AL) 26 August 1980	1,2,9,10
Y	see column 8, line 47 - column 9, line 2 ---	7,8
X	US 5 466 326 A (CHERNEY DALE M) 14 November 1995 cited in the application see column 1, line 27 - line 32 ---	1,10
Y	GB 1 260 467 A (THE BRITISH SHOE MACHINERY COMPANY LTD.) 19 January 1972	7,8
A	see page 2, line 119 - line 122; claims see page 4, line 104 - line 107 see page 5, line 28 - line 35 see claims --- -/--	1

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

3 August 1998

Date of mailing of the international search report

07/08/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Cordenier, J

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/00666

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CA 1 248 437 A (MOBIL OIL) 10 January 1989 see page 2, line 21 - line 23 see page 5, paragraph 2 ---	1,10
A	US 4 440 588 A (DEAN DONALD E ET AL) 3 April 1984 see column 9, line 36 - line 58 ---	
A	US 4 834 828 A (MURPHY COLIN R R) 30 May 1989 see column 5, line 3 - line 14 ---	1,10
A	DE 35 14 714 A (ROVEMA GMBH) 30 October 1986 see abstract; figures ---	1,2,10
A	US 2 678 679 A (F.D. BERGHSTEIN) 18 May 1954 see column 5, line 20 - line 22; figure 7 ---	7
A	GB 1 396 502 A (DRG PACKAGING LTD) 4 June 1975 see page 2, line 40 - line 45 ---	4
A	US 3 916 598 A (ADAMS PHILIP EDGAR ET AL) 4 November 1975 see column 6, line 3 - line 5; claims; figures ---	1,10
A	US 3 775 222 A (ASPIN P ET AL) 27 November 1973 see abstract; figures -----	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/00666

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4218863 A	26-08-1980	NONE	
US 5466326 A	14-11-1995	NONE	
GB 1260467 A	19-01-1972	NONE	
CA 1248437 A	10-01-1989	NONE	
US 4440588 A	03-04-1984	NONE	
US 4834828 A	30-05-1989	NONE	
DE 3514714 A	30-10-1986	NONE	
US 2678679 A	18-05-1954	NONE	
GB 1396502 A	04-06-1975	NONE	
US 3916598 A	04-11-1975	NONE	
US 3775222 A	27-11-1973	DE 2118001 A	23-12-1971
		FR 2089636 A	07-01-1972
		GB 1334856 A	24-10-1973
		SE 372453 B	23-12-1974